This key should allow you to understand why you choose the option you did (beyond just getting a question right or wrong). More instructions on how to use this key can be found here.

If you have a suggestion to make the keys better, please fill out the short survey here.

Note: This key is auto-generated and may contain issues and/or errors. The keys are reviewed after each exam to ensure grading is done accurately. If there are issues (like duplicate options), they are noted in the offline gradebook. The keys are a work-in-progress to give students as many resources to improve as possible.

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1. Determine whether the function below is 1-1.

$$f(x) = (5x - 16)^3$$

The solution is yes, which is option E.

A. No, because the domain of the function is not $(-\infty, \infty)$.

Corresponds to believing 1-1 means the domain is all Real numbers.

B. No, because there is an x-value that goes to 2 different y-values.

Corresponds to the Vertical Line test, which checks if an expression is a function.

C. No, because the range of the function is not $(-\infty, \infty)$.

Corresponds to believing 1-1 means the range is all Real numbers.

D. No, because there is a y-value that goes to 2 different x-values.

Corresponds to the Horizontal Line test, which this function passes.

E. Yes, the function is 1-1.

* This is the solution.

General Comment: There are only two valid options: The function is 1-1 OR No because there is a y-value that goes to 2 different x-values.

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2. Determine whether the function below is 1-1.

$$f(x) = 9x^2 - 30x + 25$$

The solution is no, which is option E.

A. Yes, the function is 1-1.

Corresponds to believing the function passes the Horizontal Line test.

B. No, because the range of the function is not $(-\infty, \infty)$.

Corresponds to believing 1-1 means the range is all Real numbers.

C. No, because there is an x-value that goes to 2 different y-values.

Corresponds to the Vertical Line test, which checks if an expression is a function.

D. No, because the domain of the function is not $(-\infty, \infty)$.

Corresponds to believing 1-1 means the domain is all Real numbers.

E. No, because there is a y-value that goes to 2 different x-values.

* This is the solution.

General Comment: There are only two valid options: The function is 1-1 OR No because there is a y-value that goes to 2 different x-values.

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3. Find the inverse of the function below (if it exists). Then, evaluate the inverse at $x = 12$ and choose the interval that $f^-1(12)$ belongs to.

$$f(x) = 3x^2 + 2$$

The solution is The function is not invertible for all Real numbers. , which is option E.

A. $f^{-1}(12) \in [4.74, 5.36]$

Distractor 3: This corresponds to finding the (nonexistent) inverse and dividing by a negative.

B. $f^{-1}(12) \in [2.03, 4.21]$

Distractor 2: This corresponds to finding the (nonexistent) inverse and not subtracting by the vertical shift.

C. $f^{-1}(12) \in [6.45, 8.02]$

Distractor 4: This corresponds to both distractors 2 and 3.

D. $f^{-1}(12) \in [1.74, 1.9]$

Distractor 1: This corresponds to trying to find the inverse even though the function is not 1-1.

E. The function is not invertible for all Real numbers.

* This is the correct option.

General Comment: Be sure you check that the function is 1-1 before trying to find the inverse!

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4. Subtract the following functions, then choose the domain of the resulting function from the list below.

$$f(x) = 6x^4 + 6x^2 + 7x + 7 \text{ and } g(x) = \sqrt{-5x - 15}$$

The solution is The domain is all Real numbers less than or equal to$x = -3.0$., which is option B.

A. The domain is all Real numbers except $x = a$, where $a \in [-14.4, 0.6]$

B. The domain is all Real numbers less than or equal to $x = a$, where $a \in [-4, 0]$

C. The domain is all Real numbers greater than or equal to $x = a$, where $a \in [-5.5, -0.5]$

D. The domain is all Real numbers except $x = a$ and $x = b$, where $a \in [-9.67, -4.67]$ and $b \in [-8.83, -4.83]$

E. The domain is all Real numbers.

General Comment: The new domain is the intersection of the previous domains.

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5. Choose the interval below that f composed with g at $x = 1$ is in.

$$f(x) = -2x^3 + 2x^2 + x \text{ and } g(x) = 4x^3 - 2x^2 - 2x$$

The solution is 0.0, which is option B.

A. $(f \circ g)(1) \in [-1.42, 0.53]$

Distractor 1: Corresponds to reversing the composition.

B. $(f \circ g)(1) \in [-1.42, 0.53]$

* This is the correct solution

C. $(f \circ g)(1) \in [4.53, 5.32]$

Distractor 3: Corresponds to being slightly off from the solution.

D. $(f \circ g)(1) \in [5.81, 6.62]$

Distractor 2: Corresponds to being slightly off from the solution.

E. It is not possible to compose the two functions.

General Comment: f composed with g at x means $f(g(x))$. The order matters!

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6. Find the inverse of the function below. Then, evaluate the inverse at $x = 7$ and choose the interval that $f^-1(7)$ belongs to.

$$f(x) = e^{x-3} - 3$$

The solution is $f^{-1}(7) = 5.303$, which is option A.

A. $f^{-1}(7) \in [5.1, 6.59]$

This is the solution.

B. $f^{-1}(7) \in [-1.53, 0.15]$

This solution corresponds to distractor 1.

C. $f^{-1}(7) \in [-1.53, 0.15]$

This solution corresponds to distractor 3.

D. $f^{-1}(7) \in [-1.96, -1.38]$

This solution corresponds to distractor 4.

E. $f^{-1}(7) \in [-1.96, -1.38]$

This solution corresponds to distractor 2.

General Comment: Natural log and exponential functions always have an inverse. Once you switch the x and y, use the conversion $e^y = x \leftrightarrow y = \ln(x)$.

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7. Choose the interval below that f composed with g at $x = 1$ is in.

$$f(x) = x^3 - 1x^2 - 3x + 1 \text{ and } g(x) = 3x^3 - 3x^2 + 2x$$

The solution is -1.0, which is option C.

A. $(f \circ g)(1) \in [5, 13]$

Distractor 2: Corresponds to being slightly off from the solution.

B. $(f \circ g)(1) \in [-49, -41]$

Distractor 3: Corresponds to being slightly off from the solution.

C. $(f \circ g)(1) \in [-4, 2]$

* This is the correct solution

D. $(f \circ g)(1) \in [-43, -39]$

Distractor 1: Corresponds to reversing the composition.

E. It is not possible to compose the two functions.

General Comment: f composed with g at x means $f(g(x))$. The order matters!

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8. Multiply the following functions, then choose the domain of the resulting function from the list below.

$$f(x) = \sqrt{4x - 26} \text{ and } g(x) = 6x^3 + 9x^2 + 8x + 1$$

The solution is The domain is all Real numbers greater than or equal to$x = 6.5.$, which is option C.

A. The domain is all Real numbers except $x = a,$ where $a \in [3.75, 11.75]$

B. The domain is all Real numbers less than or equal to $x = a,$ where $a \in [2.67, 12.67]$

C. The domain is all Real numbers greater than or equal to $x = a,$ where $a \in [4.5, 10.5]$

D. The domain is all Real numbers except $x = a$ and $x = b,$ where $a \in [4.2, 8.2]$ and $b \in [-7.67, 0.33]$

E. The domain is all Real numbers.

General Comment: The new domain is the intersection of the previous domains.

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9. Find the inverse of the function below (if it exists). Then, evaluate the inverse at $x = 14$ and choose the interval that $f^-1(14)$ belongs to.

$$f(x) = 5x^2 + 3$$

The solution is The function is not invertible for all Real numbers. , which is option E.

A. $f^{-1}(14) \in [1.74, 1.9]$

Distractor 2: This corresponds to finding the (nonexistent) inverse and not subtracting by the vertical shift.

B. $f^{-1}(14) \in [3.47, 3.7]$

Distractor 3: This corresponds to finding the (nonexistent) inverse and dividing by a negative.

C. $f^{-1}(14) \in [4.46, 4.89]$

Distractor 4: This corresponds to both distractors 2 and 3.

D. $f^{-1}(14) \in [1.48, 1.69]$

Distractor 1: This corresponds to trying to find the inverse even though the function is not 1-1.

E. The function is not invertible for all Real numbers.

* This is the correct option.

General Comment: Be sure you check that the function is 1-1 before trying to find the inverse!

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10. Find the inverse of the function below. Then, evaluate the inverse at $x = 8$ and choose the interval that $f^-1(8)$ belongs to.

$$f(x) = e^{x+4} - 2$$

The solution is $f^{-1}(8) = -1.697$, which is option B.

A. $f^{-1}(8) \in [0.47, 0.65]$

This solution corresponds to distractor 4.

B. $f^{-1}(8) \in [-1.94, -1.15]$

This is the solution.

C. $f^{-1}(8) \in [-1.35, -0.49]$

This solution corresponds to distractor 3.

D. $f^{-1}(8) \in [6.13, 6.88]$

This solution corresponds to distractor 1.

E. $f^{-1}(8) \in [-0.27, 0.15]$

This solution corresponds to distractor 2.

General Comment: Natural log and exponential functions always have an inverse. Once you switch the x and y, use the conversion $e^y = x \leftrightarrow y = \ln(x)$.
